

## Characteristics on the seasonal march of rainfall at Manila for the late 19<sup>th</sup> century - the early 20<sup>th</sup> century

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Rainfall is one of the most important climatic elements in Monsoon Asia, including the Philippines, because the seasonal change of rainfall is larger than that of temperature and is closely related to the water resources. Therefore, we aim to clarify longer-term variability in seasonal march of rainfall and its causes in the Philippines. To achieve our purpose, as the first step, we have collected and digitized the older meteorological observation records of the Philippines before the late 20<sup>th</sup> century under the data rescue projects in Japan. As the meteorological observations in the Philippines had been conducted by Spanish Jesuits for the late 19<sup>th</sup> century and by U.S. administration for the early 20<sup>th</sup> century, those data were found in the different places (e.g. UK, Spain and Japan). By connecting those data, we made the historical rainfall dataset in the Philippines for the period.

From the dataset, we used daily rainfall data at Manila where has the longest records of the observation in the Philippines. Based on daily rainfall at Manila from 1868 to 1940, we calculated pentad rainfall to study the seasonal change excluding daily rainfall variations. There are no data in 1875, 1877 and 1889. Manila has distinct dry season for February-April and wet season for May-October. Thus, to investigate the long-term changes in the seasonal march of rainfall at Manila, we determined the onset and withdrawal pentads of the rainy season: the onset (withdrawal) pentad corresponds to the first pentad when the pentad rainfall exceeds (falls below) 25mm since April. As results, the inter-annual variability in the onset of the rainy season since 1914 was small and the delayed withdrawal frequently appeared compared to the period before 1914. The durations of the rainy seasons for 1914-1940 were longer than those for 1950-2012. We will discuss these characteristics on the seasonal march of rainfall at Manila for the late 19<sup>th</sup> century-the early 20<sup>th</sup> century and its relation to the long-term variability in the Asian summer monsoon.

Keywords: Manila, rainfall, seasonal march, long-term change, data rescue